

VU Research Portal

Relating Petroleum System & Play Development to Basin Evolution

Beglinger, S.E.

2011

document version

Publisher's PDF, also known as Version of record

[Link to publication in VU Research Portal](#)

citation for published version (APA)

Beglinger, S. E. (2011). *Relating Petroleum System & Play Development to Basin Evolution: South Atlantic Marginal Basins*. [PhD-Thesis - Research and graduation internal, Vrije Universiteit Amsterdam].

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

E-mail address:

vuresearchportal.ub@vu.nl

Contents

Acknowledgements	XIII
Summary	XVII
Samenvatting	XXI
 Chapter 1 – Introduction	 1
1.1 Rationale	1
1.2 Objective	5
1.3 Study Area	5
1.4 Thesis Outline	6
 Chapter 2 – Terminology, Methodology & Tools	 9
2.1 Introduction	9
2.2 Terminology	9
2.3 Methodology	12
2.4 Tools	13
2.4.1 Facies Palette	14
2.4.2 Basin Cycle Dependent Trajectory Plot	14
2.4.3 Petroleum System Flow Diagram	14
2.4.4 Events Chart	14
2.4.5 Creaming Curve	15
2.4.6 Field Size Distribution Diagram	15
2.5 Risk Assessment and Future Developments	15
2.6 Conclusions	16
 Chapter 3 – Tectonostratigraphic Development of the West African and Brazilian South Atlantic Marginal Basins	 19
3.1 Introduction	19
3.2 Tectonic Basin Evolution	22
3.2.1 Geodynamic Phase Model	23
3.2.2 Cycles of Basin Evolution	25
3.2.3 Other Geodynamic Models	29
3.3 Sedimentary Basin Evolution	31
3.4 Source-, Reservoir and Seal Rock Development	39
3.5 Conclusions	41

Chapter 4 – Petroleum System- and Play Development in the West African Marginal Basins	43
4.1 Introduction	43
4.2 Petroleum System Type Development	43
4.3 Play Development	53
4.4 Conclusions	58
Chapter 5 – Petroleum System- and Play Development in the Brazilian Marginal Basins	61
5.1 Introduction	61
5.2 Petroleum System Type Development	63
5.3 Play Development	71
5.4 Conclusions	74
Chapter 6 - Prospectivity & Future Exploration: South Atlantic Marginal Basins	77
6.1 Introduction	77
6.2 South Atlantic Petroleum System Development	77
6.3 South Atlantic Play Development	78
6.4 Mixing of Hydrocarbons & Migration Pathways	84
6.5 Identifying Basin Families	84
6.6 Prospectivity & Future Exploration along the African Margin	93
6.7 Prospectivity & Future Exploration along the Brazilian Margin	95
6.8 Conclusions	101
Chapter 7 – Case-study: Relating Petroleum System- and Play Development to Basin Evolution: Gabon Coastal- versus Almada-Camamu Basin	103
7.1 Introduction	103
7.2 Study Area	103
7.3 Tectonostratigraphic Development	105
7.4 Petroleum System Development	111
7.4.1 Petroleum System Types	113
7.4.2 Analogous Petroleum Systems	115
7.4.3 Potential Petroleum Systems in the Almada-Camamu Basin	117
7.5 Play Development	120
7.5.1 Play Types	121
7.5.2 Analogous Plays	121
7.5.3 Potential Plays in the Almada-Camamu Basin	123
7.5.4 Potential Plays in the Gabon Coastal Basin	124
7.6 Petroleum Prospectivity	125
7.7 Conclusions	127

Chapter 8 – Case-study: Tectonic Subsidence & Source Rock Maturation in the Campos Basin, Brazil	131
8.1 Introduction	131
8.2 Geological Setting	132
8.3 Data & Methods	135
8.3.1 Backstripping	135
8.3.2 Forward Models	137
8.3.3 Heat Flow	140
8.4 Results	140
8.4.1 Tectonic Subsidence	140
8.4.2 Forward Models	141
McKenzie versus Syn-rift Underplating Model	141
2-Phase Underplating Model	145
8.5 Discussion	147
8.5.1 Basin Cycle Evolution	147
Syn-rift Cycle	147
Transitional Cycle	148
Post-rift Cycle	148
8.5.2 Petroleum System Development	150
Source Rock Maturation	150
Future Prospectivity	155
8.6 Conclusions	159
Chapter 9 – Synopsis & Concluding Remarks	163
9.1 Synopsis	163
9.2 Conclusions	169
9.3 Perspective	170

Appendices:

Appendix A: Source Rock Properties - West African Marginal Basins	173
Appendix A1: Douala-, Rio Muni- and Gabon Coastal basins.	174
Appendix A2: Gabon Coastal (continued)- and Lower Congo basins.	175
Appendix A3: Lower Congo (continued)-, Congo Fan-, Kwanza- and Namibe basins.	176
Appendix B: Source Rock Properties - Brazilian Marginal Basins	179
Appendix B1: Sergipe-Alagoas- and Almada-Camamu basins.	180
Appendix B2: Almada-Camamu (continued)- and Jequitinhonha basins.	181
Appendix B3: Cumuruxatiba- and Espirito Santo basins.	182
Appendix B4: Campos-, Santos- and Pelotas basins.	183

Appendix C: Play (Reservoir-Seal) Properties - West African Marginal Basins	185
Appendix C1: Douala-, Rio Muni- and Gabon Coastal basin.	186
Appendix C2: Gabon Coastal (continued)- basin.	187
Appendix C3: Lower Congo- and Congo Fan basins.	188
Appendix C4: Kwanza- and Namibe basins.	189
Appendix D: Play (Reservoir-Seal) Properties - Brazilian Marginal Basins	191
Appendix D1: Sergipe-Alagoas basin.	192
Appendix D2: Almada-Camamu- and Jequitinhonha basins.	193
Appendix D3: Cumuruxatiba- and Espirito Santos basins.	194
Appendix D4: Campos basin	195
Appendix D5: Santos- and Pelotas basins.	196
Bibliography	199